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Inophore Programs for Finishing Yearling Steers

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Summary

The relative effectiveness of three ionophore feeding strategies was compared in yearling steers. Six pens of 8 steers were assigned to each of the following treatments: A) no ionophore fed, B) lasalocid (33 g/T) fed for 28 days and then replaced with laidlomycin propionate (11 g/T) for the balance of time on feed; C) monensin (28 g/T) fed throughout, and D) laidlomycin propionate (11 g/T) fed throughout. A five diet step-up program was used that culminated in a final diet based on cracked and high moisture corn and 7% ground hay. Ionophores increased ($P<.05$) ADG (3.9%) and carcass weight and lowered ($P<.05$) feed/gain 4.5% during the 135-day feeding period. Among ionophore treatments, monensin resulted in a lower ($P<.05$) cumulative ADG and carcass weight than diets containing laidlomycin propionate. Three of the four steers removed from the trial due to metabolic disorders were from the no ionophore treatment.

Key Words: Steer, Feedlot, Ionophore

Introduction

There are currently three ionophores available for use in feedlot cattle finishing diets. Properties of lasalocid, laidlomycin propionate, and monensin differ and affect how these products are used in feeding programs. Lasalocid has little effect on DMI and adaptation appears to be easily accommodated by cattle. It is approved for use in finishing diets by virtue of its favorable effects on ADG and gain efficiency. Laidlomycin propionate has similar characteristics but has been interpreted to be a more potent effector of ADG. Its relative suitability in receiving diets has not been thoroughly evaluated. Monensin has DMI depressing characteristics that result in increased gain efficiency. It is also credited with reducing digestive problems in cattle on high grain diets. Because of its potent effect on DMI, an ionophore step-up program is recommended when adapting cattle to diets containing monensin.

The differences in these ionophores affect their suitability in any given situation. It may be possible to enhance production efficiencies by the timing of use of a product to match a stage of the feeding program. This experiment was designed to measure the efficacy of three ionophore strategies for finishing yearling steers.

Materials and Methods

Research subjects (192 head) were selected from a group of 233 yearling steers. The steers were predominately Limousin crosses reared on one ranch. The group was backgrounded at a feedlot 70 miles from the research feedlot. The 677-lb mean purchase weight represented yearlings with minimal flesh. Upon arrival at the feedlot, steers were tagged, weighed, vaccinated (Resvac 3, Ultrabac 7), and treated for internal parasites (Synanthic paste) and ecto parasites (Synergized DeLice) according to label instructions. Cattle of odd type were noted for deleting from the sample population.

The experiment involved four treatments and six pen replicates of eight steers per treatment. Diet treatments included A) no ionophore, B) lasalocid (33 g/T DMB) for 28 days followed by laidlomycin propionate (LP; 11 g/T DMB), C) monensin (MON; 28 g/T DMB), and D) LP (11 g/T DMB) throughout. The complete diets and component supplements are outlined in Tables 1, 2, and 3. To accommodate adaptation to monensin, supplements for

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Table 1. Diet formulations

	% DM basis					
Ingredient	Step 1	Step 2	Step 3	Step 4	Step 5	Step 5A
Ground hay	7.00	7.00	7.00	7.00	7.00	7.00
Rolled corn	30.90	30.90	40.90	45.90	48.90	78.90
High moisture corn	5.00	20.00	25.00	28.00	30.00	–
Liquid supplement[a]	4.50	4.50	4.50	4.50	4.50	4.50
Dry supplement[b]	9.60	9.60	9.60	9.60	9.60	9.60
Oat silage	43.00	28.00	13.00	5.00	–	–
Days fed	1 to 2	3 to 4	5 to 7	8 to 11	12 to 108	to finish
DM	50.5	58.1	69.2	77.6	82.9	86.3
CP, %	14.0	13.6	13.2	12.9	13.0	13.4
NDF, %	32	25	18	15	13	13
Ash, %	6.8	5.5	4.1	3.4	2.9	2.9
NE_m, Mcal/cwt[c]	77.6	83.5	89.6	92.4	94.4	96.3
NE_g, Mcal/cwt	46.9	52.6	58.3	61.0	62.6	64.0
Laidlomycin propionate, g/T[d]	11.5	11.5	11.5	11.4	10.8	11.5
Monensin, g/T[d]	14.5	14.5	14.5	28.9	29.6	28.2

[a]See Table 2 for formulation.
[b]See Table 3 for formulation.
[c]Based upon tabular feed values.
[d]Only one ionophore used in diets as assigned by treatment.

Table 2. Custom liquid mixes

	LS O		LS O
DM, %	68.35	Zn, ppm	433
CP, %	7.71	NaCl, %	6.95
Ca, %	12.76	I, ppm	7.20
P, %	.60	Fe, ppm	1273
K, %	9.26	Se	5.16
Mg, %	.39	Vitamin A, IU	39,886
S, %	.36	Vitamin D, IU	9,964
Mn, ppm	267	Vitamin E, IU	379
Co, ppm	1.9	Ne_m	49.92
Cu, ppm	93	Ne_g	33.29

Table 3. Dry supplement formulations

	%, DM basis
Soybean meal, 44%	80.20
Urea	4.17
Wheat midds	15.63
	g/T as fed basis
Bovatec 68	1170
Cattlyst 50G	945
Rumensin 80	1477

treatments A (control) and C (monensin) were used in a 1:1 ratio to produce a 14 g/T diet for the initial 7 days. Cattle were fed twice daily. The feed for the six pen replicates in each treatment was mixed in a single batch at each feeding. To facilitate allotment of steers, processing weights were arranged by increasing BW. Extremely light or heavy BW steers were deleted. Steers were randomly allotted to treatments A to D and subsequently to replicates 1 to 6. Within 40 hours of arrival at the feedlot, steers were sorted into assigned pens. Steers were fed 12 lb of a nonmedicated receiving diet for the next 4 days (June 9 to 12). Initial test BW was the mean of BW determined the mornings of June 12 (day 0) and 13 (day 1). This corresponded to days 3 and 4 of fixed DMI. Synovex-S was administered to all steers during the second initial BW measurement.

Individual BW were determined on day 0, 1, 28, 56, 84, 112, 136, and 137. Revalor implants were administered on day 56. Animals were observed twice daily for health problems. When health problems were noted, steers were generally removed to a hospital pen for closer observation. The home pen diet was fed to hospitalized steers and upon recovery steers were returned to their original pen. If normal appetite and well-being were not reestablished while in the hospital, steers were removed from the test. When steers were removed, their contribution to pen mean BW was deleted from the data set. Those steers were assumed to consume feed at the pen mean level except while in the hospital where individual DMI was known. Feed records were adjusted accordingly.

Feed bunks were managed to allow cattle access to as much feed as they could apparently metabolize based on feed carryover and animal behavior. Dramatic fluctuations in feed delivery were minimized. During the aggressive step-up phase, true ad libitum DMI was not allowed. Increases in feed deliveries were restricted when most of the steers in a pen exhibited diarrhea. Because of this approach, differences in DMI reflect the influence of treatment on the onset of gastrointestinal upset rather than the DMI depression resulting from acute digestive upset.

Diet commodity ingredients were sampled each week. Corn was analyzed for DM, CP, and ash content. Hay was analyzed for DM, CP, ADF, NDF, and ash content. Dry supplements were sampled when delivered and analyzed for DM, CP, ash, and ionophore content. Diet composition was calculated based on batch sheet ingredient inclusion and analyzed composition of ingredients. Tabular values were used for corn and dry supplement fiber content. Specification values were used for the nutrient content of liquid supplements. Data reported in Table 1 reflect weekly calculations.

To verify mix integrity, bunk samples were obtained during the afternoon feeding on days steers were weighed. Sampling was accomplished by placing a 5" x 11" x 13" dishpan midway along the bunk as each pen was fed. Feed contained in this pan after feed delivery was retained. The supplement and bunk samples were submitted to analytical labs for ionophore assay.

The evening after the final BW determination, steers were co-mingled and shipped to the abattoir and harvested the next morning. Carcasses were identified at exsanguination to accommodate evaluation 24 hours later. Carcass weight, rib fat thickness, and rib eye area were measured. Marbling score and percentage of KPH were estimated by the federal grader on duty.

All feedlot performance data were evaluated on a pen mean basis. Steers were not deprived of feed or water prior to any BW measurements. The final BW was shrunk 3%

only to calculate cumulative ADG and dressing percentage. Carcass data were evaluated on an individual steer basis. All data were analyzed using procedures in SAS that are appropriate for a completely random design experiment. To test treatment means, orthogonal contrasts were established. These contrasts included control vs ionophores (A vs B, C, D), lasalocid-laidlomycin propionate vs laidlomycin propionate (B vs D), and lasalocid-laidlomycin propionate + laidlomycin propionate vs monensin (B, D vs C). Probabilities for contrasts are noted in tables of results.

Results

Four steers were removed from the experiment and subsequently deleted form the data set. One steer was removed from Trt B on day 21 because of a stifle injury. Two steers were removed from Trt A and one steer from Trt B because of persistent bloat problems. These removals caused the effect of treatment on initial BW depicted in Table 4.

Diets were formulated to contain 11 g LP/T or 28 g MON/T. Bunk samples collected on days 29, 57, 85, and 113 averaged 10.6 g LP, 29.3 g MON, and 10.2 g LP/T for treatments B, C, and D, respectively (Table 4).

Control vs Ionophores

Use of restricted feeding 12 lb per head per day pretrial allowed only partial fill. The influences of fill and condition of the steers resulted in extraordinary performance during the initial 28 days on feed. During this phase ionophores affected (P=.1075) feed efficiency in spite of remarkably low feed/gain values for control steers (Table 4). The only other period where ionophores improved feed/gain over controls was from 57 to 84 days (P<.001). Despite the lack of consistent interim influence from ionophores, cumulative 135-day data showed a 4.5% improvement (P=.0169) in feed/gain when ionophores were fed.

From 29 to 56 and 85 to 112 days, ionophores tended (P=.15) to depress ADG. In contrast, from 57 to 84 and 113 to 135 days ionophores increased ADG (P<.01). Overall, ionophores increased ADG 3.9% (P<.01). The effect of ionophores on ADG was related to influences of ionophores on DMI only during the period 29 to 56 days. That was the only period in which ionophores affected (depressed) DMI (P<.01).

Laidlomycin Propionate vs Monensin

Steers fed LP tended to consume more feed (P=.1011) than steers fed MON from 29 to 56 days. This was largely due to the increase in DMI that occurred for steers switched from lasalocid to LP at day 29 (Trt B). During the 85- to 112-day period, dry corn replaced high moisture grain. In this period the ADG of control steers increased over previous 28-day intervals of performance and ADG of steers fed MON decreased. The formulation change occurred at day 108 and two pens on treatment C responded adversely, becoming diarrhetic and experiencing depressed appetites. The ADGs of steers on treatment C rebounded during day 113 to 135, but overall LP caused a 4.4% greater ADG (P=.0177) than MON.

Lasalocid Start-up

Treatment B tended to cause higher ADG (P=.1196) and DMI (P=.0877) over treatment D during the 29- to 58-day period. This corresponds to the time when treatment B was switched from lasalocid to LP. It should be noted that 1 to 28-day ADG was also numerically higher when LP was fed. These data suggest a positive gain response associated with ruminal adaptation to LP whether it is during receiving or as a substitute for a previous ionophore. These episodes of increased ADG associated with adapting to LP contributed to the LP gain response over MON.

Carcass Traits

Feeding ionophores increased (P<.05) hot carcass weight and dressing percent over controls. Feeding LP increased hot carcass weight (P=.04) and dressing percent (P=.06) over MON (Table 5).

Treatments did not influence quality or yield grades of carcasses. The percentage of choice was lower than is typical for this facility when we meet carcass criteria of .4 in. rib fat. Quality grades may have been influenced by several factors including genetics and weather (heat stress). Cattle performance had diminished markedly in the 112- to 135-day period, suggesting further days on feed were not appropriate.

Conclusions

These data support previously documented influences of LP on feedlot cattle performance. They also indicate that LP can be used in start-up diets without adverse effects. The data do suggest a favorable ADG response during adaptation to LP when introduced on day 1 or day 28. This phenomenon should be further explored.

Table 4. Feedlot performance summary

	Treatment				P<		
Item	A[a]	B[b]	C[c]	D[d]	A vs B,C,D	B vs D	C vs B,D
Initial BW	683	686	689	689	.0700	NS[e]	NS
			1 to 28 days				
BW 28	844	850	857	861	.0285	.1010	NS
ADG	5.74	5.88	5.98	6.13	NS	NS	NS
DMI	18.13	18.12	17.98	17.98	NS	NS	NS
F/G	3.18	3.09	3.03	2.95	.1075	NS	NS
			29 to 56 days				
BW 56	971	976	974	977	NS	NS	NS
ADG	4.55	4.51	4.20	4.15	.1503	.1196	NS
DMI	24.20	23.42	22.10	22.42	.0033	.0877	.1011
F/G	5.33	5.23	5.31	5.42	NS	NS	NS
			57 to 84 days				
BW 84	1083	1112	1115	1115	.0009	NS	NS
ADG	3.98	4.85	5.01	4.92	.0026	NS	NS
DMI	24.81	25.85	24.76	25.15	NS	NS	NS
F/G	6.43	5.34	4.94	5.15	.0010	NS	NS
			85 to 112 days				
BW 112	1219	1245	1227	1251	.0052	NS	.0105
ADG	4.85	4.77	4.01	4.89	.0744	NS	.0002
DMI	26.35	27.03	26.28	26.72	NS	NS	NS
F/G	5.52	5.68	6.57	5.48	NS	NS	.0049
			113 to 135 days				
BW 135	1286	1318	1298	1325	.0058	NS	.0208
ADG	2.92	3.14	3.08	3.20	NS	NS	NS
DMI	24.51	24.60	24.29	25.00	NS	NS	NS
F/G	8.73	8.27	8.05	8.37	NS	NS	NS
			1 to 135 days[f]				
BW 135[g]	1247	1278	1259	1285	.0058	NS	.0208
ADG	4.18	4.39	4.22	4.42	.0244	NS	.0177
DMI	23.57	23.77	23.04	23.40	NS	NS	NS
F/G	5.65	5.42	5.47	5.30	.0169	NS	NS

[a]Control.
[b]Lasalocid-laidlomycin propionate.
[c]Monensin.
[d]Laidlomycin propionate.
[e]P>.15.
[f]Based on shrunk final BW (day 135).
[g]BW 135*.97.

Table 5. Carcass traits[a]

	Treatment				P<		
Item	A[b]	B[c]	C[d]	D[e]	A vs B,C,D	B vs D	C vs B,D
HCW	783	812	791	814	.0274	NS[f]	.0411
Dressing %	62.75	63.54	62.83	63.35	.1209	NS	.0657
Adj. HCW[g]	785	813	789	813	.0163	NS	.0055
Rib fat, in.	.395	.427	.379	.402	NS	NS	.0899
Rib eye area, $in.^2$	13.59	13.97	13.69	14.02	NS	NS	NS
KPH, %	2.03	2.10	2.04	2.16	NS	NS	NS
Marbling[h]	4.83	4.73	4.74	4.79	NS	NS	NS
Choice, %	21	15	16	22	NS	NS	NS
Yield grade	2.52	2.60	2.48	2.55	NS	NS	NS

[a]Least squares means.
[b]Control.
[c]Lasalocid-laidlomycin propionate.
[d]Monensin.
[e]Laidlomycin propionate.
[f]P<.15.
[g]Corrected using initial BW as covariate.
[h]4.0 = slight°, 5.0 = small°.